

This Professional Services Contract (the "**Contract**") is agreed to between the Michigan Departments of Attorney General, Environmental Quality, and Natural Resources and the Michigan Agency for Energy (the "**State**") and Det Norske Veritas (U.S.A.), Inc. ("**Contractor**"), a Texas corporation. This Contract is effective on August 24, 2016 ("**Effective Date**"), and unless terminated, expires on October 31, 2017 (the "**Term**").

The parties agree as follows:

1. **Definitions.** For the purposes of this Contract, the following terms have the following meanings:

"**Business Day**" means a day other than a Saturday, Sunday or other day on which the State is authorized or required by Law to be closed for business.

"**Confidential Information**" has the meaning set forth in **Section 16**.

"**Contract**" has the meaning set forth in the preamble.

"**Contract Administrator**" is the individual appointed by each party to (a) administer the terms of this Contract, and (b) approve any Change Notices under this Contract. Each party's Contract Administrator will be identified in **Section 5**.

"**Contractor**" has the meaning set forth in the preamble.

"**Contractor personnel**" means all employees of Contractor or any Subcontractors involved in the performance of Services and creation of Deliverables under this Contract.

"**Deliverables**" means documentation, reports, and all other materials that Contractor or any Subcontractor is required to or otherwise does provide to the State under this Contract and otherwise in connection with any Services, including all items specifically identified as Deliverables in the Statement of Work.

"**Effective Date**" has the meaning set forth in the preamble.

"**Key Personnel**" means any Contractor Personnel identified as key personnel in this Contract or and the Statement of Work.

"**Services**" means any of the services Contractor, or any Subcontractor, is required to or otherwise does provide under this Contract and the Statement of Work.

"**State**" has the meaning set forth in the preamble.

"**Statement of Work**" has the meaning set forth in **Section 2**.

"**Subcontractor**" has the meaning set forth in **Section 3**.

2. **Statement of Work.** The Statement of Work is attached hereto as Exhibit A and includes the following:

- a. A detailed description of the Services to be provided by Contractor;
- b. A listing of the Key Personnel;

- c. A detailed description of the Deliverables to be developed or otherwise provided by Contractor, including any required milestone dates associated with such Deliverable; and
- d. Fees payable under the Statement of Work, the manner in which such Fees will be calculated, the due dates for payment and any invoicing requirements, including any milestones on which any such Fees are conditioned, and such other information as the parties deem necessary.

3. Performance of Services.

- a. **Performance Warranty.** Contractor represents and warrants that its Services hereunder shall be performed by competent personnel and shall be of professional quality consistent with generally accepted industry standards for the performance of such services and shall comply in all respects with the requirements of this Contract and the specifications set forth in the Statement of Work. Contractor's responsibilities with regard to deficient/defective services or deliverables shall be limited to such defect being rectified by Contractor during a period of twelve (12) months following completion of the services or delivery of the deliverables, whichever is deficient/defective (the "Warranty Period"). State shall give Contractor verbal notice, confirmed in writing, within the Warranty Period, specifying, in reasonable detail, the defect in the Services and/or Deliverables, as soon as the defect becomes apparent. This warranty is EXCLUSIVE AND, EXCEPT AS STATED HEREIN, CONTRACTOR MAKES NO EXPRESS OR IMPLIED WARRANTIES AS TO ANY MATTER WHATSOEVER, INCLUDING WITHOUT LIMITATION, THE WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE OR USE WHICH EXCEED THE FOREGOING WARRANTY.
- b. **Contractor Personnel.** Contractor is solely responsible for all Contractor personnel and for the payment of their compensation, including, if applicable, withholding of income taxes, and the payment and withholding of social security and other payroll taxes, unemployment insurance, workers' compensation insurance payments and disability benefits.
- c. **Subcontractors.** Except as provided in the Statement of Work, Contractor will not, without the prior written approval of the State, which consent may be given or withheld in the State's sole discretion, engage any third party to perform Services (including to create any Deliverables). The State's approval of any such third party (each approved third party, a "**Subcontractor**") does not relieve Contractor of its representations, warranties or obligations under this Contract. Without limiting the foregoing, Contractor will:
 - i. be responsible and liable for the acts and omissions of each such Subcontractor (including such Subcontractor's employees who, to the extent providing Services or creating Deliverables, shall be deemed Contractor personnel) to the same extent as if such acts or omissions were by Contractor or its employees;
 - ii. name the State a third party beneficiary under Contractor's contract with each Subcontractor with respect to the Services and Deliverables;
 - iii. be responsible for all fees and expenses payable to, by or on behalf of each Subcontractor in connection with this Contract, including, if applicable, withholding of income taxes, and the payment and withholding of social security and other payroll taxes, unemployment

insurance, workers' compensation insurance payments and disability benefits; and

- iv. prior to the provision of Services or creation of Deliverables by any Subcontractor, if requested by the State:
 1. obtain from such Subcontractor confidentiality, work-for-hire and intellectual property rights assignment agreements, in form and substance acceptable by the State, giving the State rights consistent with those set forth in **Section 8** and, upon request, provide the State with a fully-executed copy of each such contract; and
 2. with respect to all Subcontractor employees providing Services or Deliverables, comply with its obligations under **subsection b** above.

d. **Access to Information.** The State shall provide the Contractor, without undue delay, all relevant information and documentation requested by Contractor that is available to the State and shall request Enbridge to provide such relevant information and documentation requested by Contractor required for Contractor to carry out any Services as identified in the Statement of Work in accordance with the applicable requirements and Contractor's independent role.

e. **Deliverables.** Unless otherwise agreed to in writing by Contractor, the State shall only make available the Deliverables or parts thereof to third parties without altering the content, context or original language of the Deliverable.

4. **Notices.** All notices and other communications required or permitted under this Contract must be in writing and will be considered given and received: (a) when verified by written receipt if sent by courier; (b) when actually received if sent by mail without verification of receipt; or (c) when verified by automated receipt or electronic logs if sent by facsimile or email.

If to State:	If to Contractor:
Robert P. Reichel 525 W. Ottawa Lansing, MI 48933 reichelb@michigan.gov Phone: 517-373-7540	Group Legal, Americas 1400 Ravello Drive Katy, Texas, 77449 legal.NA@dnvgl.com Phone: 281-396-1000

5. **Contract Administrators.** The Contract Administrator for each party is the only person authorized to modify any terms and conditions of this Contract and are identified below:

State:	Contractor:
Robert P. Reichel 525 W. Ottawa Lansing, MI 48933 reichelb@michigan.gov Phone: 517-373-7540	Charlie King 1400 Ravello Drive Katy, Texas, 77449 Charles.king@dnvgl.com Phone: 281-396-1000

6. **Insurance Requirements.** Contractor must maintain the insurances identified below and is responsible for all deductibles. All required insurance must: (a) protect the State from claims that may arise out of, are alleged to arise out of, or result from Contractor's or a subcontractor's performance; (b) be primary and non-contributing to any comparable liability insurance

(including self-insurance) carried by the State; and (c) be provided by an company with an A.M. Best rating of "A" or better and a financial size of VII or better.

Insurance Type	Additional Requirements
Commercial General Liability Insurance	
<u>Minimal Limits:</u> \$1,000,000 Each Occurrence Limit \$1,000,000 Personal & Advertising Injury Limit \$2,000,000 General Aggregate Limit \$2,000,000 Products/Completed Operations <u>Deductible Maximum:</u> \$50,000 Each Occurrence	Contractor must have their policy endorsed to add "the State of Michigan, its departments, divisions, agencies, offices, commissions, officers, employees, and agents" as additional insureds using endorsement CG 20 10 11 85, or both CG 2010 07 04 and CG 2037 07 0.

Contractor must: (a) provide insurance certificates to the Contract Administrator, containing the agreement or purchase order number, at Contract formation and within 20 calendar days of the expiration date of the applicable policies; (b) require that subcontractors maintain the required insurances contained in this Section; (c) notify the Contract Administrator within 5 Business Days if any insurance is cancelled; and (d) waive all rights against the State for damages covered by insurance. Failure to maintain the required insurance does not limit this waiver.

This Section is not intended to and is not be construed in any manner as waiving, restricting or limiting the liability of either party for any obligations under this Contract (including any provisions hereof requiring Contractor to indemnify, defend and hold harmless the State).

7. **Independent Contractor.** Contractor is an independent contractor and assumes all rights, obligations and liabilities set forth in this Contract. As an independent contractor, Contractor has complete control, supervision and direction over its equipment and personnel and over the manner and method of the performance of the Services. Contractor shall have the sole right to control, and shall be solely responsible for controlling, the means and details of the Services to be performed by Contractor and/or other individuals designated by Contractor under the terms of this Agreement. Subject to the requirements of the State, as specified in the relevant Statement of Work, Contractor shall be responsible for establishing the dates, times, hours, sequence, and manner in which Contractor performs its services hereunder. Contractor, its employees, and agents will not be considered employees of the State. No partnership or joint venture relationship is created by virtue of this Contract. Contractor, and not the State, is responsible for the payment of wages, benefits and taxes of Contractor's employees and any subcontractors. Prior performance does not modify Contractor's status as an independent contractor.
8. **Intellectual Property Rights.** Contractor hereby acknowledges that the State is and will be the sole and exclusive owner of all right, title, and interest in the Services and Deliverables and all associated intellectual property rights, if any. Such Services and Deliverables are works made for hire as defined in Section 101 of the Copyright Act of 1976. To the extent any Services and Deliverables and related intellectual property do not qualify as works made for hire under the Copyright Act, Contractor will, and hereby does, immediately on its creation, assign, transfer and otherwise convey to the State, irrevocably and in perpetuity, throughout the universe, all right, title and interest in and to the Services and Deliverables, including all intellectual property rights therein. Notwithstanding the above, both parties agree that any pre-existing intellectual property rights and any improvements thereto remain the property of the party who developed them.

9. **Assignment.** Except with regard to its affiliated entities, Contractor may not assign this Contract to any other party without the prior written approval of the State.
10. **Payment.** Using funds drawn solely from the escrow account established under the terms of the Escrow Agreement among Enbridge Energy Company, Inc., the State of Michigan and U. S. Bank National Association dated August 18, 2016, the State shall pay Contractor \$ 756,000.00 for its Services as specified in this Contract and the Statement of Work. The state will make payments under this Contract by directing the Escrow Agent to disburse payments by electronic funds transfers to the Contractor's designated bank account under the terms of the Escrow Agreement. The State will not make any payments from the State Treasury.

Invoices must conform to the requirements set forth in the Statement of Work. All undisputed amounts are payable within 45 days of the State's receipt. Contractor may only charge for Services and Deliverables performed as specified in the Statement of Work. Invoices must include an itemized statement of all charges. The State is exempt from State sales tax for direct purchases and may be exempt from federal excise tax, if Services and Deliverables purchased under this Contract are for the State's exclusive use. Notwithstanding the foregoing, all prices are inclusive of taxes, and Contractor is responsible for all sales, use and excise taxes, and any other similar taxes, duties and charges of any kind imposed by any federal, state, or local governmental entity on any amounts payable by the State under this Contract.

The State has the right to withhold payment of any reasonably disputed amounts, under this Contract, until the parties agree as to the validity of the disputed amount. The State will notify Contractor of any dispute within a reasonable time. Payment by the State will not constitute a waiver of any rights as to Contractor's continuing obligations, including claims for deficiencies or substandard Services or Deliverables.

11. **Termination for Cause.** The State may terminate this Contract, in whole or in part if Contractor, as determined by the State: (a) becomes insolvent, petitions for bankruptcy court proceedings, or has an involuntary bankruptcy proceeding filed against it by any creditor; or (b) breaches any of its material duties or obligations under this Contract or the Statement of Work and fails to cure a breach within the time stated in a notice of breach. Any reference to specific breaches being material breaches within this Contract will not be construed to mean that other breaches are not material.

If the State terminates this Contract under this Section, the State will issue a termination notice specifying whether Contractor must: (a) cease performance immediately, or (b) continue to perform for a specified period. If it is later determined that Contractor was not in breach of the Contract, the termination will be deemed to have been a Termination for Convenience, effective as of the same date, and the rights and obligations of the parties will be limited to those provided in **Section 12**, Termination for Convenience.

The State will only pay for amounts due to Contractor for Services and Deliverables delivered to the State on or before the date of termination, subject to the State's right to set off any amounts owed by the Contractor for the State's reasonable costs in terminating this Contract.

12. **Termination for Convenience.** The State may, upon thirty (30) days' notice to Contractor, terminate this Contract, in whole or in part without penalty and for any reason. The termination notice will specify whether Contractor must: (a) cease performance of the Services immediately, or (b) continue to perform the Services in accordance with **Section 13**, Transition Responsibilities. If the State terminates this Contract for convenience, the State will pay all reasonable costs, as determined by the State, for State approved Transition Responsibilities.

13. **Transition Responsibilities.** Upon termination or expiration of this Contract for any reason, Contractor must, for a period of time specified by the State (not to exceed 90 calendar days), provide all reasonable transition assistance requested by the State, to allow for the expired or terminated portion of the Services to continue without interruption or adverse effect, and to facilitate the orderly transfer of such Services to the State or its designees.
14. **General Indemnification.** Contractor must defend, indemnify and hold the State, its departments, divisions, agencies, offices, commissions, officers, and employees harmless, from and against any and all actions, claims, losses, liabilities, damages, costs, attorney fees, and expenses (including those required to establish the right to indemnification), arising out of or relating to: (a) any breach by Contractor (or any of Contractor's employees, agents, subcontractors, or by anyone else for whose acts any of them may be liable) of any of the promises, agreements, representations, warranties, or insurance requirements contained in this Contract; (b) any infringement, misappropriation, or other violation of any intellectual property right or other right of any third party; (c) any bodily injury, death, or damage to real or tangible personal property occurring wholly or in part due to action or inaction by Contractor (or any of Contractor's employees, agents, subcontractors, or by anyone else for whose acts any of them may be liable); and (d) any acts or omissions of Contractor (or any of Contractor's employees, agents, subcontractors, or by anyone else for whose acts any of them may be liable).

The State will notify Contractor in writing if indemnification is sought; however, failure to do so will not relieve Contractor, except to the extent that Contractor is materially prejudiced. Contractor must, to the satisfaction of the State, demonstrate its financial ability to carry out these obligations.

The State is entitled to: (i) regular updates on proceeding status; (ii) participate in the defense of the proceeding; and (iii) employ its own counsel. Contractor will not, without the State's written consent (not to be unreasonably withheld), settle, compromise, or consent to the entry of any judgment in or otherwise seek to terminate any claim, action, or proceeding. To the extent that any State employee, official, or law may be involved or challenged, the State may, at its own expense, control the defense of that portion of the claim.

Any litigation activity on behalf of the State, or any of its subdivisions under this Section, must be coordinated with the Department of Attorney General. An attorney designated to represent the State may not do so until approved by the Michigan Attorney General and appointed as a Special Assistant Attorney General.

15. **Limitation of Liability.** IN NO EVENT WILL EITHER PARTY BE LIABLE, REGARDLESS OF THE FORM OF ACTION, WHETHER IN CONTRACT, TORT, NEGLIGENCE, STRICT LIABILITY OR BY STATUTE OR OTHERWISE, FOR ANY CLAIM RELATED TO OR ARISING UNDER THIS CONTRACT FOR CONSEQUENTIAL, INCIDENTAL, INDIRECT, OR SPECIAL DAMAGES, INCLUDING WITHOUT LIMITATION LOST PROFITS AND LOST BUSINESS OPPORTUNITIES. NOTWITHSTANDING ANYTHING TO THE CONTRARY IN THIS AGREEMENT OR ANY STATEMENT OF WORK, IN NO EVENT WILL EITHER PARTY'S AGGREGATE LIABILITY TO THE OTHER PARTY UNDER THIS CONTRACT, REGARDLESS OF THE FORM OF ACTION, WHETHER IN CONTRACT, TORT, NEGLIGENCE, STRICT LIABILITY OR BY STATUTE OR OTHERWISE, FOR ANY CLAIM RELATED TO OR ARISING UNDER THIS CONTRACT, EXCEED THE LESSER OF (A) THE MAXIMUM AMOUNT OF FEES PAID TO CONTRACTOR AS SPECIFIED IN THE STATEMENT OF WORK OR (B) USD \$ 1,000,000.
16. **Non-Disclosure of Confidential Information.** The parties acknowledge that each party may be exposed to or acquire communication or data of the other party that is confidential, privileged

communication not intended to be disclosed to third parties. The provisions of this Section survive the termination of this Contract.

- a. Meaning of Confidential Information. For the purposes of this Contract, the term "**Confidential Information**" means all information and documentation of a party that: (a) has been marked "confidential" or with words of similar meaning, at the time of disclosure by such party; (b) if disclosed orally or not marked "confidential" or with words of similar meaning, was subsequently summarized in writing by the disclosing party and marked "confidential" or with words of similar meaning; and, (c) should reasonably be recognized as confidential information of the disclosing party. The term "Confidential Information" does not include any information or documentation that was or is: (a) subject to disclosure under the Michigan Freedom of Information Act (FOIA) by the receiving party; (b) already in the possession of the receiving party without an obligation of confidentiality; (c) developed independently by the receiving party, as demonstrated by the receiving party, without violating the disclosing party's proprietary rights; (d) obtained from a source other than the disclosing party without an obligation of confidentiality; or, (e) publicly available when received, or thereafter became publicly available (other than through any unauthorized disclosure by, through, or on behalf of, the receiving party).
 - b. Obligation of Confidentiality. The parties agree to hold all Confidential Information in strict confidence and not to copy, reproduce, sell, transfer, or otherwise dispose of, give or disclose such Confidential Information to third parties other than employees, agents, or subcontractors of a party who have a need to know in connection with this Contract or to use such Confidential Information for any purposes whatsoever other than the performance of this Contract. The parties agree to advise and require their respective employees, agents, and subcontractors of their obligations to keep all Confidential Information confidential. Disclosure to a subcontractor is permissible where: (a) use of a subcontractor is authorized under this Contract; (b) the disclosure is necessary or otherwise naturally occurs in connection with work that is within the subcontractor's responsibilities; and (c) Contractor obligates the subcontractor in a written contract to maintain the State's Confidential Information in confidence. At the State's request, any employee of Contractor or any subcontractor may be required to execute a separate agreement to be bound by the provisions of this Section.
17. **Warranties and Representations.** Contractor represents and warrants to the State that: (a) It will perform all Services in a professional manner in accordance with generally accepted industry standards for the performance of such services and the terms of this Contract, using personnel with the requisite skill, experience and qualifications, and will devote adequate resources to meet its obligations under the applicable Statement of Work; (b) the Services and Deliverables provided by Contractor will not infringe the patent, trademark, copyright, trade secret, or other proprietary rights of any third party; (c) it has the full right, power, and authority to enter into this Contract, to grant the rights granted under this Contract, and to perform its contractual obligations; and (d) to the best of Contractor's knowledge and belief at the time of execution of this Contract that, all information furnished and representations made in connection with the award of this Contract are true, accurate, and complete, and contain no intentional misrepresentations or omit any material fact that would make the information misleading. A breach of this Section is considered a material breach of this Contract, which entitles the State to terminate this Contract under **Section 11**, Termination for Cause.
18. **Conflicts and Ethics.** Contractor will uphold high ethical standards and is prohibited from: (a) holding or acquiring an interest that would conflict with this Contract; (b) doing anything that creates an appearance of impropriety with respect to the award or performance of the Contract;

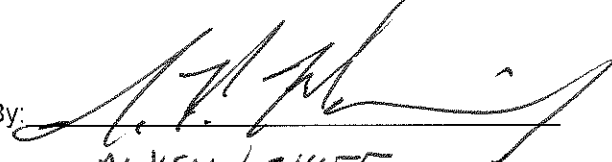
or (c) attempting to influence or appearing to influence any State employee by the direct or indirect offer of anything of value.

19. **Compliance with Laws.** Contractor must comply with all applicable federal, state and local laws, rules and regulations.
20. **Nondiscrimination.** Under the Elliott-Larsen Civil Rights Act, 1976 PA 453, MCL 37.2101, *et seq.*, and the Persons with Disabilities Civil Rights Act, 1976 PA 220, MCL 37.1101, *et seq.*, Contractor and its subcontractors agree not to discriminate against an employee or applicant for employment with respect to hire, tenure, terms, conditions, or privileges of employment, or a matter directly or indirectly related to employment, because of race, color, religion, national origin, age, sex, height, weight, marital status, or mental or physical disability. Breach of this covenant is a material breach of this Contract.
21. **Unfair Labor Practice.** Under MCL 423.324, the State may void any Contract with a Contractor or subcontractor who appears on the Unfair Labor Practice register compiled under MCL 423.322.
22. **Governing Law.** This Contract is governed, construed, and enforced in accordance with Michigan law, excluding choice-of-law principles, and all claims relating to or arising out of this Contract are governed by Michigan law, excluding choice-of-law principles. Any dispute arising from this Contract must be resolved in Michigan Court of Claims. Contractor consents to venue in Ingham County, and waives any objections, such as lack of personal jurisdiction or *forum non conveniens*. Contractor must appoint agents in Michigan to receive service of process.
23. **Force Majeure.** Neither party will be in breach of this Contract because of any failure arising from any disaster or acts of God that are beyond their control and without their fault or negligence. Each party will use commercially reasonable efforts to resume performance. Contractor will not be relieved of a breach or delay caused by its subcontractors. If immediate performance is necessary to ensure public health and safety, the State may immediately contract with a third party.
24. **Dispute Resolution.** The parties will endeavor to resolve any Contract dispute in accordance with this provision. The dispute will be referred to the parties' respective Contract Administrators or Project Managers. Such referral must include a description of the issues and all supporting documentation. The parties must submit the dispute to a senior executive if unable to resolve the dispute within 15 Business Days. The parties will continue performing while a dispute is being resolved, unless the dispute precludes performance. A dispute involving payment does not preclude performance, unless the dispute remains unresolved more than ninety (90) days from the date the parties Contract Administrators or Project Managers are notified.

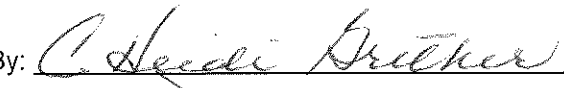
Litigation to resolve the dispute will not be instituted until after the dispute has been elevated to the parties' senior executive and either concludes that resolution is unlikely, or fails to respond within 15 Business Days. The parties are not prohibited from instituting formal proceedings: (a) to avoid the expiration of statute of limitations period; (b) to preserve a superior position with respect to creditors; or (c) where a party makes a determination that a temporary restraining order or other injunctive relief is the only adequate remedy. This Section does not limit the State's right to terminate the Contract.
25. **Media Releases.** News releases (including promotional literature and commercial advertisements) pertaining to the Contract or project to which it relates must not be made without prior written State approval, and then only in accordance with the explicit written instructions of the State.

26. **Severability.** If any part of this Contract is held invalid or unenforceable, by any court of competent jurisdiction, that part will be deemed deleted from this Contract and the severed part will be replaced by agreed upon language that achieves the same or similar objectives. The remaining Contract will continue in full force and effect.
27. **Waiver.** Failure to enforce any provision of this Contract will not constitute a waiver.
28. **Survival.** The provisions of this Contract that impose continuing obligations, including warranties and representations, termination, transition, insurance coverage, indemnification, and confidentiality, will survive the expiration or termination of this Contract.
29. **Entire Agreement.** This Contract, including the Statement of Work, constitutes the sole and entire agreement of the parties to this Contract with respect to the subject matter contained herein, and supersedes all prior and contemporaneous understandings and agreements, both written and oral, with respect to such subject matter. In the event of any conflict between the terms of this Contract and those of the Statement of Work or other document, the following order of precedence governs: (a) first, this Contract; and (b) second, the Statement of Work as of the Effective Date of that Statement of Work. NO TERMS ON CONTRACTOR'S INVOICES, WEBSITE, BROWSE-WRAP, SHRINK-WRAP, CLICK-WRAP OR OTHER NON-NEGOTIATED TERMS AND CONDITIONS PROVIDED WITH ANY OF THE SERVICES, OR DOCUMENTATION HEREUNDER WILL CONSTITUTE A PART OR AMENDMENT OF THIS CONTRACT OR IS BINDING ON THE STATE FOR ANY PURPOSE. ALL SUCH OTHER TERMS AND CONDITIONS HAVE NO FORCE AND EFFECT AND ARE DEEMED REJECTED BY THE STATE, EVEN IF ACCESS TO OR USE OF SUCH SERVICE OR DOCUMENTATION REQUIRES AFFIRMATIVE ACCEPTANCE OF SUCH TERMS AND CONDITIONS.
30. **Counterparts.** This Contract may be signed in any number of counterparts, each of which is a duplicate original, and all of which taken together form a single Contract.

MICHIGAN DEPARTMENT OF ATTORNEY GENERAL

By: 
Title: DIVISION CHIEF

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

By: 
Title: Director

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

By: _____

Title: _____

MICHIGAN AGENCY FOR ENERGY

By: _____

Title: _____

DET NORSKE VERITAS (U.S.A.), INC.

By: _____

Title: _____

EXHIBIT A
STATEMENT OF WORK

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Appendix A

Introduction and Background

DNV GL is an international classification society and verification body in the Oil & Gas, Energy, and Maritime industries. The scope of work in this Request for Information and Proposal is ideally aligned with our purpose to safeguard life, property and the environment.

Under the recommends of the Michigan Petroleum Pipeline Task Force (MPPTF), the Michigan Departments of Environmental Quality, the Michigan Department of Natural Resources, the Michigan Agency for Energy, and the Michigan Office of Attorney General (the State) issued a Request for Information and Proposals (RFIP) for an Independent Risk Analysis for the Straits Pipelines. Specific recommendations regarding the Straits Pipelines were:

1. Prevent the transportation of heavy crude oil through the Straits Pipelines.
2. Require an independent risk analysis and adequate financial assurance for the Straits Pipelines.
3. Require an independent analysis of alternatives to the existing Straits Pipelines.
4. Obtain additional information from Enbridge relating to the Straits Pipelines.

The Request for Information and Proposals focuses specifically on Recommendation 2.a.—the analysis of the pipeline operator's potential liability from a worst-case spill or release scenario. In accordance with the Request, DNV GL herein submits this proposal to conduct an independent risk assessment of the consequences of a worst case discharge of oil and Natural Gas Liquids (NGLs) from the pipeline. The assessment will provide important information to the State regarding the potential environmental and economic impacts of a worst case spill, as well as financial information related to the response and recovery costs associated with a worst case spill.

The Straits Pipelines are operated by Enbridge and traverse beneath the waters of the Straits of Mackinac. They consist of two, 4.6 mile, 20" pipelines carrying light crude oil, propane, and potentially other petroleum based products.

The Straits of Mackinac connect Lakes Michigan and Huron, two of the five Great Lakes. The Great Lakes are the largest freshwater system on Earth, containing an estimated 20% of all the liquid surface fresh water on Earth. The United States draws more than 40 billion gallons of water from the Great Lakes every day—half of which is used for electrical power production, and is critical to the lives of more than 35 million people in the US and Canada. The Great Lakes support one of the world's largest regional economies, including a \$7 billion fishery and \$16 billion tourism industry. More than 3,500 species of plants and animals live in the Great Lakes basin. More than 170 species of fish inhabit the Great Lakes, their tributaries and connecting waterways (University of Wisconsin Sea Grant Institute, 2013).

About DNV GL

Driven by our purpose of safeguarding life, property and the environment, DNV GL functions as an independent third party and enables organizations to advance the safety and sustainability of their business. We provide independent classification and technical assurance along with software and independent expert advisory services to the maritime, oil and gas, and energy industries. We also provide independent certification services to customers across a wide range of industries. Operating in more than 100 countries, our 15,000 professionals are dedicated to helping make the world safer, smarter and greener.

Our 151 year history of independent verification services has set us apart as a trusted partner to both industry and regulatory bodies worldwide. Our experience and understanding of pipeline risk make us an ideal choice to bring thorough, accurate, and defensible results to this study.

Schedule for the Requested Approach

The general philosophy behind the schedule is to complete one element of the work every month. The goal is to communicate results from one element in each monthly webinar or meeting involving all appropriate parties, indicated by ▲. The first element's findings would be shared five to six weeks after project kickoff. This approach will facilitate collection of feedback and any additional input as the work progresses. The formal write-up for each element will become an appendix to the main report, which will be issued as a whole document on September 20. This process will efficiently collect comments on each appendix monthly, so that review of the draft assembled report can focus on the findings and key issues.

Budget ID	Description	Days	Start Date	End Date	Sep-16	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17
1	Task A. Duration and Magnitude of a Worst Case Spill	31	9/2/2016	10/3/2016	▲											
2	Task B. Environmental Fate and Transport of Worst Case Spills	65	9/2/2016	11/6/2016		▲										
3	Task C. Duration of Activities to Contain and Cleanup Worst Case Spills	42	10/2/2016	12/1/2016			▲									
4	Task D. Short and Long Term Public Health and Safety Impacts	51	11/1/2016	1/7/2017				▲								
5	Task E. Short and Long Term Ecological Impacts of Worst Case Spills	64	11/1/2016	1/20/2017					▲							
6	Task F. Measures to Restore Natural Resources and Mitigate Ecological Impacts	106	11/1/2016	3/3/2017						▲						
7	Task G. Natural Resource Damages from Worst Case Spills	49	1/19/2017	3/9/2017							▲					
8	Task H. Governmental Costs of Worst Case Spills/Response Costs	77	1/19/2017	4/6/2017								▲				
9	Task I. All Other Economic Damages of Worst Case Spills	56	2/1/2017	4/14/2017									▲			
10	Project Management, Report Assembly, Comments, and Meetings	316	9/19/2016	7/22/2017												
10a	Develop and Issue Draft Report	119	1/20/2017	5/19/2017												
10b	Address Comments on Draft Report and Issue Revised Report	22	6/30/2017	7/22/2017											▲	
10c	Address Comments on Revised Report and Issue Final Report	14	8/5/2017	8/19/2017												▲

Each webinar constitutes a milestone, and is associated with a specific deliverable for an element or the draft / final report.

The above schedule reflects the Requested Approach, which generally develops a high level of detail for a complete list of aspects, and sums the results to achieve a view of the whole.

Requested Approach and Alternatives

This section describes the methods that would be used to perform each of the requested elements of the Scope of Work. Section 2.1.1 lists the technical leader for each of the elements. DNV GL has a significant number of global resources with experience in detailed aspects of spill analysis, impact prediction, spill response, cleanup and restoration, and economic impact estimation. The most relevant supporting resources will make up the execution teams steered and quality assured by the team leaders.

Figure 1 lists the requested scope elements, which are described in Section 6.1 through 6.10. The labels for the tasks have been shortened from those in the Request for the ease of the reader.

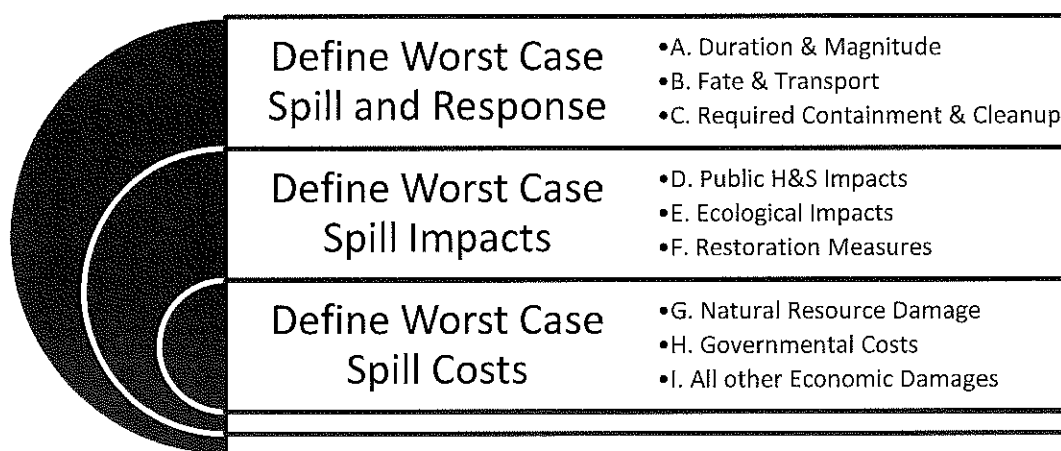


Figure 1 Requested Scope of Work

The stated objectives could also be achieved using semi-quantitative techniques appropriate for wide-scale assessments. This alternative approach would expedite the completion of the work while still achieving the stated objectives of the analysis, which are to identify the level of financial assurance required to cover worst case spills from the Straits Pipelines.

This proposal is based on use of existing scientific data on the environment and impact/cost effects from spilled products. Existing data and studies will be utilized; no new primary or academic research studies are included in this bid.

Task A. Duration and Magnitude of Worst Case Spills

This task includes identifying the “worst case discharge” consistent, at a minimum, with the definition of that term in 40 CFR 194.5 as “the largest foreseeable discharge of oil, including a discharge from fire or explosion, in adverse weather conditions.” The identification of the “worst case” will also consider, consistent with best practices in high-hazard industries, the maximum potential release, before applying engineering and procedural controls intended to minimize releases. The identification of the “worst case” should also consider the most adverse foreseeable weather conditions including, but not limited to, storms and/or ice cover. The analysis would include, but not be limited to, consideration of the following:

1. The design and placement of the existing pipelines, control systems, leak detection methods, and shut-off valves to determine the various types of physical or operational failures or other potential

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- hazards that could result in releases of oil or other products, including both sudden releases and longer-term releases that could be undetected using the existing systems ;
2. The types of products being transported and the maximum design flow rate;
 3. The potential failure of release detection methods, control systems, or shut-off valves to operate as intended;
 4. The quantity of the oil or other products that could be released at the maximum design flow rate before the flow was cut off; and
 5. The quantity and fate of oil or other products remaining in the affected pipeline(s) at the maximum design flow rate after the flow is cut off.

In line with the above DNV GL will consider, consistent with best practices in high-hazard industries, specific scenarios which will include:

- 3 hole size failures with differing volume / release duration;
- 3 products/materials transported in the pipelines; and
- 2 seasons (summer/winter) represented in the weather and metocean data, including consideration of storm events.

A maximum of 18 scenarios will be evaluated as "worst case" scenarios, each one a combination of hole size, material being transported, and season. The need to have these 18 base case scenarios is driven by the variety in the outcomes that are evaluated later in the study. While more than 3 products have historically been transported in the pipelines, not every material /season combination will need to be modeled, only those combinations that have unique consequences or impacts. A total of 18 base case scenarios is expected to be sufficient for a robust analysis of the possible combinations.

The above combinations account for both sudden and long term releases in the different failure sizes. Based on our previous experience in hydrocarbon risk assessment, particularly with pipelines, a longer duration smaller leak size (smaller hole in the pipe) event can release more product to the environment prior to being detected than a very large hole, full pipe bore failure event. The duration and the types of impacts would be different, and will be evaluated for the outcomes/cost categories evaluated in the study.

As is common with hydrocarbon equipment risk assessments, procedural controls intended to minimize releases are accounted for, but only in relation to the *potential* for a more severe event– they might reduce or prevent the more severe event. However, procedural and engineering controls have well documented failure frequencies, and so will not guide the analysis of a worst case event. Exceptions can be made for high reliability equipment that is maintained as such, usually indicated as Safety Integrity Level – 3 (SIL-3).

Design aspects that will be reviewed to identify representative cases include:

1. Design of the existing pipelines;
2. Location of the lines (GIS tools will be used in the models);
3. Control system logic and functioning;

4. Leak detection methods and response philosophies; and,
5. Shut-off valves, manual valves, and check valves (as relevant to the segment and scenarios being studied).

The estimate of potential worst case discharge volume will be calculated as a time-based discharge curve. The calculation will consider:

1. Leak rate through the hole size being considered at the pipeline design throughput and Maximum Allowable Operating Pressure (MAOP).
2. Time to isolate the section, which will include only high reliability engineered equipment and maximum detection times.
3. The volume of product that could leak out of the hole over time after the section is isolated. This will vary by product, and is highly dependent on elevation changes in the pipeline along the segment and where the hole in relationship to elevation changes in the line. For this Task, no volume reduction will be calculated for response efforts to reduce the spill volume by removing product trapped in the line.

High resolution georeferenced data for the pipeline location and elevation will be needed from Enbridge for this work; together with historical and planned products through the lines; aspects of the control system, logic, and detection systems that might be considered in this study; precise locations of valves in and near the segment and philosophies concerning when and how they are activated. If any systems or items are SIL rated, more specific information concerning assurance of the rating will be requested. All other needed data is already in hand, has already been requested from Enbridge, or will be obtained from public sources.

Task B. Environmental Fate and Transport of Worst Case Spills

DNV GL proposes to use OSCAR software to study the environmental fate and transport of the products released by the worst case spills. Results are presented as probability maps for the different environmental compartments (water surface, water masses or shoreline). Results will take into consideration seasonal oil spills, accounting for ice coverage. Based on the project needs, DNV GL suggests modeling the 18 scenarios defined in Task A.

The SINTEF OSCAR model (MEMW 7.0.1) is an Oil Spill Contingency and Response model system that calculates and records the distribution (as mass and concentrations) of contaminants on the water surface, on shorelines, in the water column, and in sediments.

For a subsurface pipeline spill, the near field part of the simulation is conducted with a multi-component integral plume model that is embedded in the OSCAR model. The near field model accounts for buoyancy effects of oil and gas (if present), as well as effects of ambient stratification and cross flow on the dilution and rise time of the plume. The effect of lake stratification in the summer and turnover will be evaluated to assure the worst case effects are represented in the model.

The model output is recorded in three physical dimensions plus time. The model databases supply values for water depth, sediment type, ecological habitat, and shoreline type. The system has an oil physical-chemical database that supplies physical and chemical parameters required by the model.

The model computes surface spreading, slick transport, entrainment into the water column, evaporation, emulsification and shoreline interactions to determine oil drift and fate at the surface. In the water column, horizontal and vertical transport by currents, dissolution, adsorption, settling and degradation are simulated.

OSCAR may compute oil or product weathering from crude assay data, although more reliable results are produced if the target oil has been through a standardized set of laboratory weathering procedures established by laboratories. Alternatively, the model may use oil weathering properties from oils for which data already exists, selecting the crude oil in the oil database that most closely matches the composition of the oil of concern.

Both single spill scenarios and stochastic scenarios with variable start times can be simulated. In the stochastic simulations, both historical wind and high resolution current data is required. This is to cover the variations in oil drift and fate due to different wind and current situations. The set of scenarios to be run may be specified either by selecting the number of scenarios to be simulated within a specified time period (single year statistics), or by specifying the number of scenarios to be run each year in a specified season (multiyear statistics).

OSCAR accepts as input both 2- and 3-dimensional current data from hydrodynamic models, and single point or gridded wind data from meteorological models. For these one statistical run will comprise a large number of spills with a specified spill rate and duration with spill start distributed evenly within the period of years with available wind data. The number of spills to be simulated in one statistical run must be large enough to provide a basis for reliable oil drift statistics on a seasonal basis (winter, spring, summer and autumn), but the actual number required depends on the duration of each spill: in order to cover the total variability in wind and current data within the period with wind data, more simulations will be required for spills with short durations than for spills with long durations.

The present version of OSCAR model takes the ice-coverage as an adjusting parameter into the calculations. The fractional ice cover/ice concentration can be provided as grids similar to current, wind or habitat data. The ice cover affects weathering, spreading, evaporation of surface oil, as well as drifting of oil with ice. The oil preserves in the ice and evaporation and down mixing will be reduced leading to more oil at the surface due to less influence by the wind compared to simulations without ice. Due to the special environmental conditions with ice, a second stage of response capability estimation can be utilized if needed.

In order to provide data for computing oil drift statistics, certain oil drift parameters are accumulated for each scenario in each impacted grid cell. These results are in the end used to calculate probabilities for impact in a given cell – defined in terms of exceeding certain threshold values for oil concentrations.

Necessary input for a pipeline leakage modeling:

- Release location
- Water depth at location
- Spill rate and duration
- Area of leakage
- Gas/oil ratio (if gas is present)
- Physical oil characteristics (oil weathering study)

Capability of the SINTEF OSCAR Model

OSCAR is a state of the art model and simulation tool for predicting the fates and effects of oil released during an accidental release of oil from pipelines, oil platform, or a vessel. OSCAR was developed by SINTEF research institute in close collaboration with the oil industry and authorities. OSCAR provides insight in the behavior of oil during a release and captures the effects of contingency and response, allowing for contingency analysis and planning as well as hind- and forecasting of oil drift.

OSCAR delivers high resolution fate and dispersion of oil and gas from small spills and leakages to worst case spill scenarios which makes it a proper tool for pipeline consequence assessment. The model is effective and can handle a wide variety of spill rates and durations in a single setup. This allows for modelling fate and dispersion for worst case scenarios and more realistic spill scenarios. The fate of the released oil is modelled for following environmental compartments; sediment, water column, water surface and shoreline as well evaporation to air.

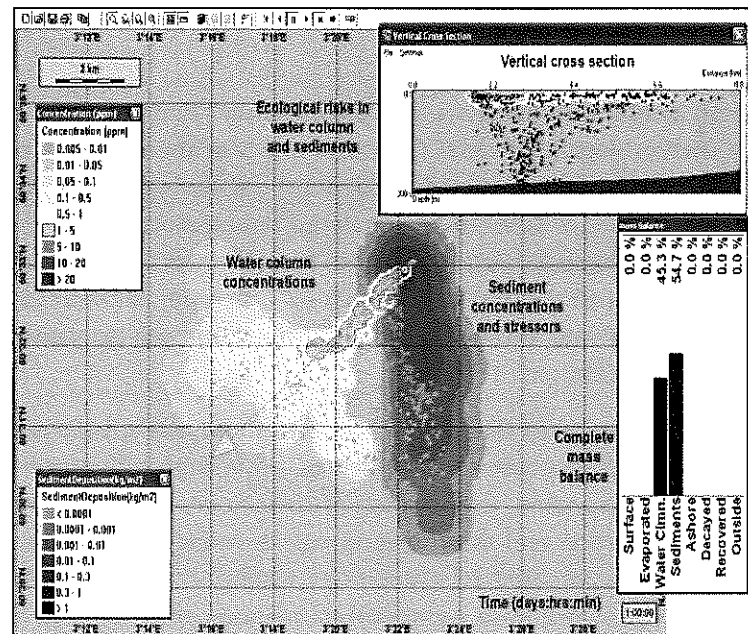


Figure 2 OSCAR Hydrocarbon Surface Model Output

The model accounts for weathering, the physical, biological and chemical processes affecting oil at sea. Many of these processes are strongly coupled with laboratory studies at SINTEF on oil weathering. Contingency and response strategies provided ranges from mechanical collection of oil to dispersant application on surface and in water.

OSCAR has been involved in and is still in use for planning, hind- and forecasting of accidental releases in locations such as the Northern and Baltic Sea, Gulf of Mexico and the Mediterranean Sea.

OSCAR is continuously updated and actively developed with the industry in order to improve the existing model. OSCAR has a near zone modelling feature that recently has been updated based on in situ validations (Johansen et al. 2013)¹. Other models like Oil Map and MIKE3 has implemented the algorithms developed by

¹ Johansen et al. 2013. Droplet breakup in subsea oil releases – Part 2: Predictions of droplet size distributions with and without injection of chemical dispersants. Marine Pollution Bulletin.

SINTEF. OSCAR was used by NOAA and BP during the Macondo oil spill. Based on the experience Macondo SINTEF updated the model to better reflect the natural dispersion and re-surfacing of oil droplets.

Also the oil spill contingency feature in the model is continuously updated based on annual field trials with oil spill on water. This is the only model that regularly gets input from controlled offshore field oil spill trials, most models relies on laboratory and test pool experience only.

OSCAR also supports doing stochastic modelling, providing insight in how distinctive oil spill scenario behaves under a wide range of weather or seasonal conditions. The stochastic feature makes the model very suitable for combining with risk assessment. The model estimates the probability of oil polluting sensitive environmental resources and important socioeconomic resources. The probability of oil pollution is quantified in terms of volume on shoreline, oil slick thickness and volume on sea surface, THC concentration in the water column and oil amount in sediment. The model is closely connected with the environmental impact and risk models that will be applied in the study.

Task C. Duration of Activities to Contain and Cleanup Worst Case Spills

DNV GL proposes to assess the capabilities and limitations of existing spill response measures by evaluating the Area Contingency Plan (ACP), relevant Spill Prevention, Control and Countermeasures (SPCC) Plans, and Enbridge-specific response plans. Plans will be evaluated against both regulatory criteria and Lessons Learned from multi-agency pollution response exercises conducted in the Straits of Mackinac.

The assessment of response resources will include identification of all response resources that can be brought to bear on a worst case discharge and will include a tiered, response time-based categorization of available resources.

The assessment of response personnel will include an evaluation of state, federal, and local response agencies billeted and available personnel, training criteria, and exercise participation.

A thorough review of exercise and incident After Action Reports, Lessons Learned, and other relevant documents will be conducted to gain an understanding of the duration of activities that may be necessary to contain and cleanup a worst case spill.

DNV GL will rely on the cooperation of a number of agencies to acquire the necessary information to complete this task including the US Coast Guard, US Fish & Wildlife Agency, US EPA, MDEQ, MDNR, MSP, and others. DNV GL may request assistance from MDEQ (or other agencies) to facilitate acquisition of necessary reports, documents, etc. DNV GL will execute task C in collaboration with state of Michigan domain expert.

A qualitative assessment of the aforementioned documents, combined with interviews with relevant agency plan holders, will be performed to evaluate the time and anticipated resource needs to contain and clean up a worst case spill. DNV GL will identify potential interview subjects and vet them through the MPPTF to ensure adequate representation of the oil spill response community. To manage travel costs, it is envisioned that interviews will primarily be conducted telephonically, though in-person interviews may be conducted in conjunction with other task items, if feasible.

Task D. Short and Long Term Public Health and Safety Impacts

On April 20, 2010 an explosion, fire and hydrocarbon release from the Deepwater Horizon platform in the Gulf of Mexico resulted in the largest oil spill in U.S. history. In that incident workers, responders, marine life and eventually coastal populations were exposed to varying levels of hydrocarbons, particulate matter, aerosol

particles and various gaseous combustion products such as carbon monoxide, carbon dioxide, and nitrous/sulfur dioxides as well as hydrogen sulfide. According to USEPA there were four sources of air pollutants from the Deepwater Horizon incident including:

1. Hydrocarbons evaporating from the oil on the surface,
2. Smoke from deliberately burning of oil slick,
3. Combustion products from flaring of recovered natural gas,
4. Emission from ships involved in the recovery/clean-up effort.

Although a pipeline release in the Strait of Mackinac would be much different in character it is anticipated that similar air pollutants could be generated from the three pipeline products if there was a full bore release, especially in the presence of an ignition source.

The results from Task B will be utilized to determine the distribution of the each released product in the water column, the surface spread of the product involved and any losses to atmosphere, without ignition (Figure 3).

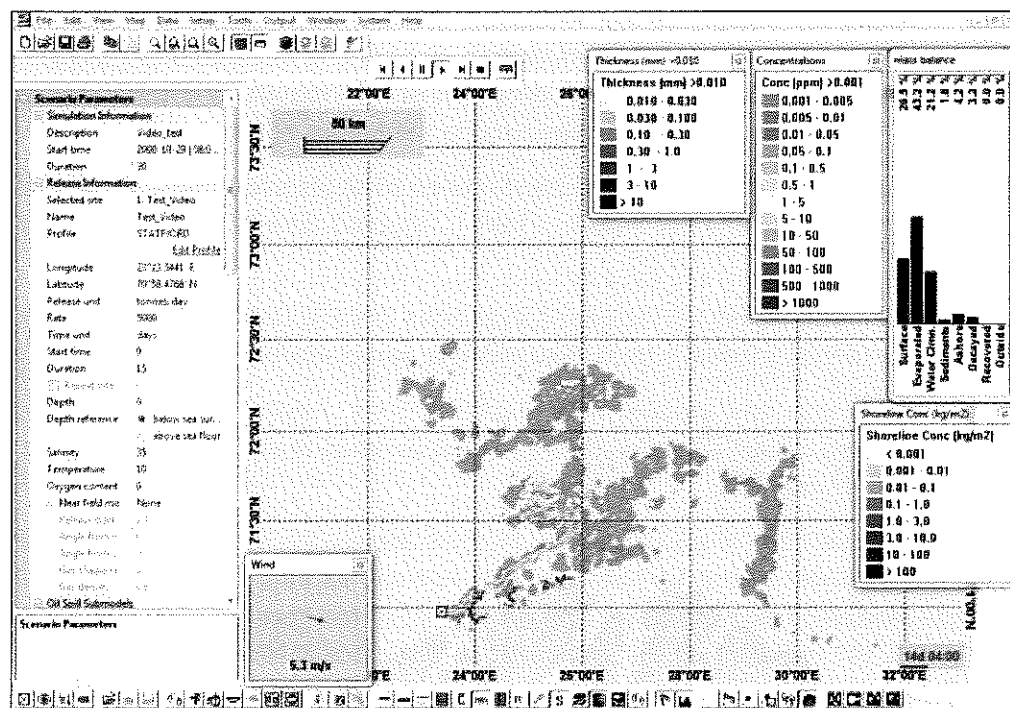


Figure 3 OSCAR Hydrocarbon Surface Model Output

Figure 4 illustrates the OSCAR model output for pollutants released into the water column as well as their general flow direction and concentration.

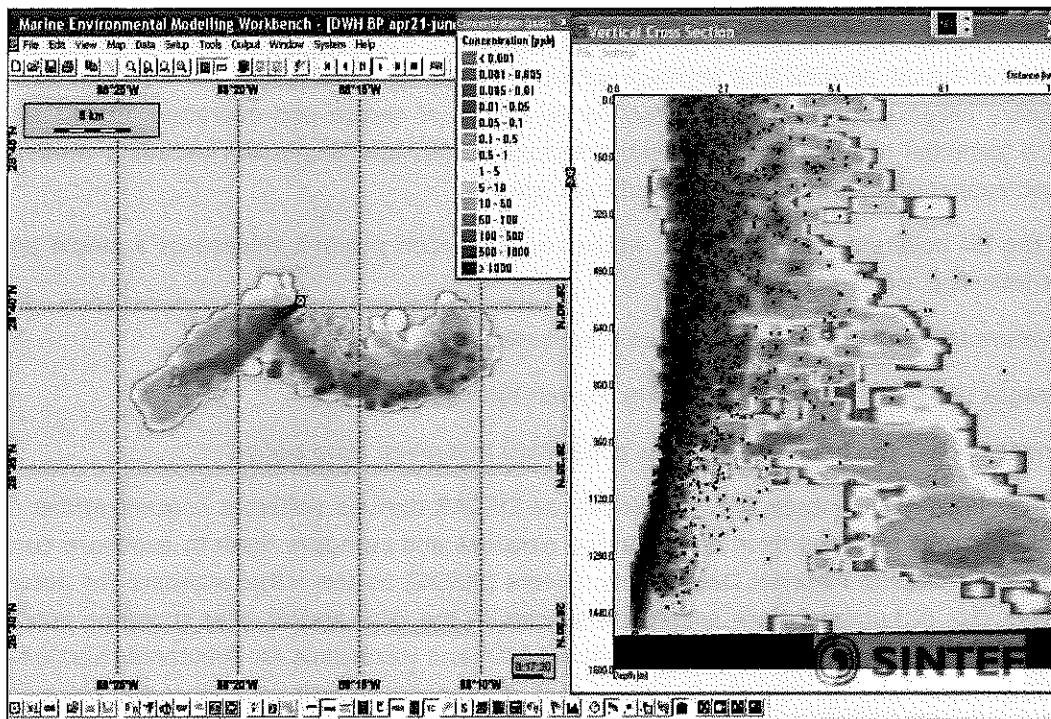


Figure 4 OSCAR Water Column Pollutant Model Results

OSCAR is also capable of modeling shoreline impacts given the volume released, air and wind currents and the distance from landfall (Figure 5).

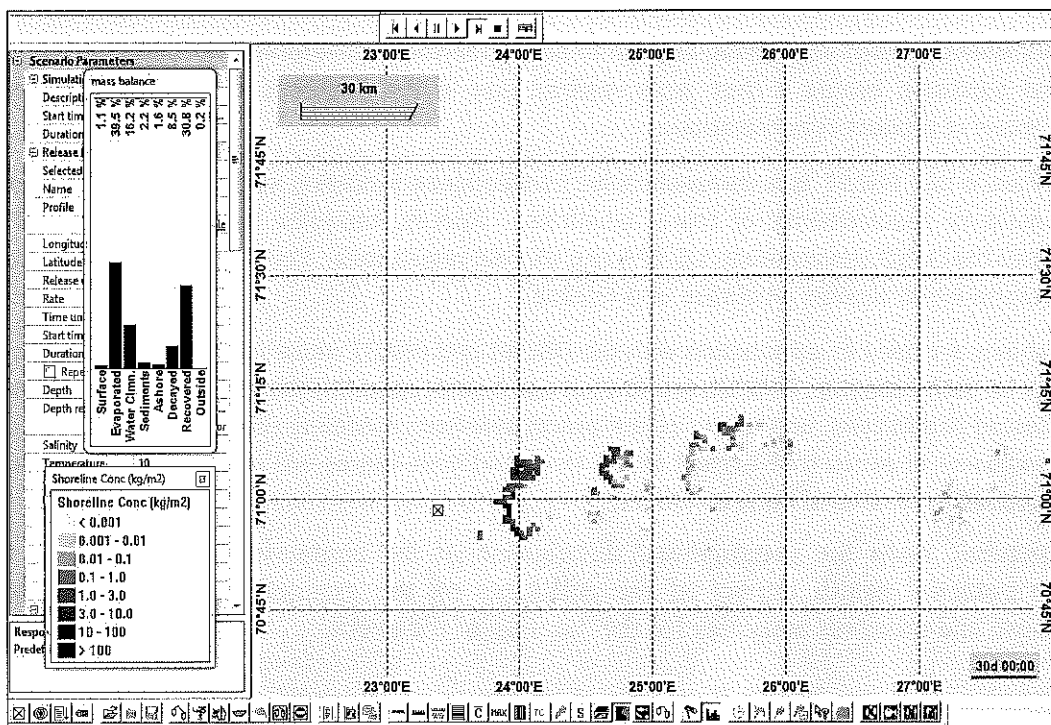


Figure 5 OSCAR Shoreline Impact Model Output

If there was an ignition scenario, then DNV GL PHAST software would be utilized to further define the extent of atmospheric pollutant plumes and or fire/explosion effects. PHAST is the world's most comprehensive process industry hazard analysis software tool for all stages of design and operation. PHAST examines the progress of a potential incident from the initial release to far-field dispersion including modelling of pool spreading and evaporation, and flammable and toxic effects.

To simplify the air pollutant study DNV GL would consider each product release as a single pollutant and consider the following measures:

- Maximum levels of pollutant in a given time period
- Averages of pollutant concentrations in a given time period
- Number of days the pollutant exceeds a standard in a given time period

Due to the high level of this study DNV GL would use OSCAR derived pollutant concentrations of the three products hypothetically released from the Enbridge pipelines and compare them to exposure concentrations documented in the product Material Data Safety Sheets (MSDS) as the initial standard for determining the levels of health risk to humans, flora and fauna species in the lake and/or near shoreline ecosystems and populations. The USEPA Drinking Water Act (Section 1400) and Hazardous Air Pollutants (Section 112) would be supplemental references for determining the extent of exposure to human, animal and plant species.

DNV GL believes that the OSCAR modeling results would be effective in determining those areas exceeding exposure standards outlined in product MSDS sheets for inhalation, ingestion and dermal contact. The modeling results would overlay at risk populations and environmentally sensitive environments to define a worst case exposure scenario for each product.

PHAST results would be used in a similar fashion to define thermal or overpressure contours that would result from fire and explosion events if they were realized due to the presence of an ignition source and the appropriate levels of product concentrations.

DNV GL's software tool PHAST is a comprehensive consequence modeling software tool designed to comply with the regulatory requirements of many countries. Specific modules have been included to ensure compliance with the Dutch Government, US EPA and UK HSE regulations. PHAST is an integrated consequence modeling package which models all stages of a release.

Impact thresholds are used in conjunction with the OSCAR and PHAST modeling to estimate the extent of the consequences to each category. DNV GL would then use a semi-quantitative approach to assessing impacted health on affected populations, and to the extent practicable from modeling results, determine whether or not the risks of exposure in zones that exceed MSDS threshold limit values will result in acute or chronic illness effects or degradation of natural flora and fauna.

Finally, depending upon the geographical distribution of the contaminated zone, DNV GL would estimate the potential health impact of the pollutants on the exposed public, aquatic ecosystems, recreational use and transport activities for the duration of the event.

Task E. Short and Long Term Ecological Impacts of Worst Case Spills

DNV GL has a long history developing spill risk methods and providing oil spill risk assessments, and was responsible for drafting the published International Oil and Gas Producers guideline on this topic published in

2013 (IOGP/IPIECA, 2013). Our approach is a quantitative impact assessment based on the overlap between the effect area (from the spill modelling in Task B), the distribution of ecological resources, and the sensitivity of these resources towards an oil spill (both on individual level regarding exposure and on population level regarding recovery). Available environmental sensitivity index maps and species distribution maps will be gathered and utilized for this work.

For the various environmental compartments, the effect area will be defined from the oil trajectory and fate as the area where predicted environmental concentrations are above the predicted no-effect concentration level ($P_{EC} > P_{NEC}$) for acute effects. The short term mortality will be quantified and assessed, and the long term ecological impact will be assessed in terms of recovery time of the affected natural resources. Data from historical oil spill events will be used as a reference for estimating the magnitude of impacts and the recovery rates of species and habitats.

Impacts will be described and assessed for:

- Water quality
- Fish and aquatic life
- Wildlife
- Shoreline habitats
- Air quality

Regarding air quality, it is envisaged that only one scenario will be examined focusing on an agreed list of pollutants. The oil spill source will be modelled to understand the dispersion effects under different meteorological conditions. The results (maximum ground level concentrations and concentrations at selected key receptors) will then be compared against relevant short term criteria and conclusions made.

Task F. Measures to Restore Natural Resources and Mitigate Ecological Impacts of Worst Case Spills

This task will identify specific measures that could mitigate ecological impacts from a spill making use of the results of previous tasks. The approach is to utilize well-established tools to obtain answers in new ways. The process is depicted in Figure 6.

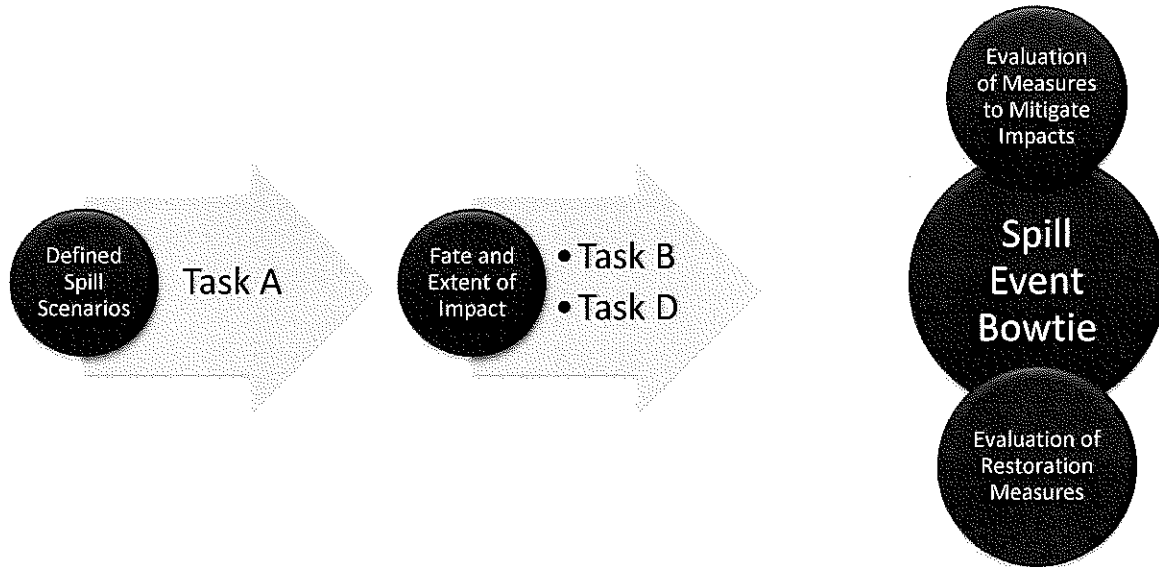


Figure 6 Task F Methodology

One of the key components of this task is one or more bowtie. A bowtie (Figure 7) is a well-known tool in the oil and gas industry, which is well suited to help identify and communicate risk controls, both preventive and mitigative in nature. The hazard being assessed is transport of hazardous material in a pipeline. The left hand side of the bowtie lists the threats and causes that could result in a loss of containment, or spill. The right hand side lists the consequences and effects from the spill. In between are barriers, which could independently reduce the frequency or severity, or prevent them altogether.

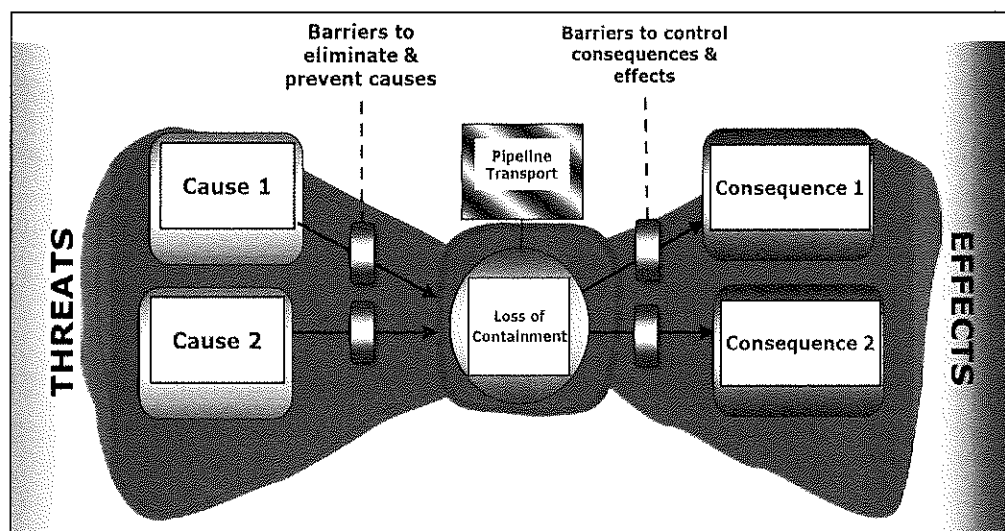


Figure 7 Example Bowtie

The number of bowties will depend on the significance of the differences between the 18 scenarios selected for evaluation. The bowties will be developed in a workshop attended by the technical leads and other key participants that may be identified in the early portion of the study.

Once potential measures are identified, they will be evaluated per affected resource concerning:

- Effectiveness in reducing risk. Effectiveness will be evaluated in a semi-quantitative manner at a sufficient level of detail to allow differentiation between the options.
- Implementability and availability. It is imperative that all recommendations could be enacted and then verified, and that the means to do so is reasonably obtainable. The evaluation will initially be done in a workshop format, with any remaining technical actions followed up by subject matter experts.
- Cost (to facilitate transparent comparison between options).

Proposed Methodology Regarding Tasks G (Natural Resource Damages), H (Governmental Costs), and I (Other Economic Damages)

DNV GL proposes to assess potential environmental impacts from each alternative using the methodology depicted in Figure 8.

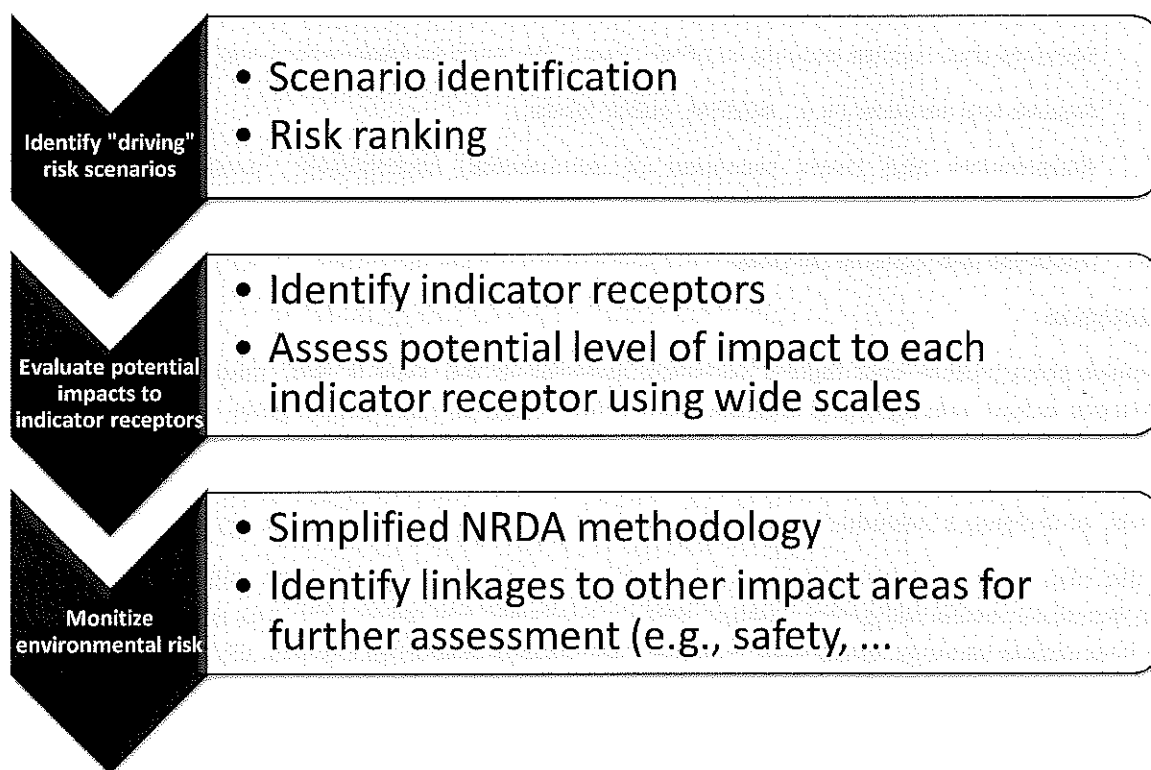


Figure 8 Process to Evaluate NRD

The general approach proposed for Tasks G, H, and I is unlain by a philosophy of balancing the need for accuracy and completeness with the potential disadvantages of time and cost of the study.

Task G. Natural Resource Damages from Worst Case Spills

Natural resource damage (NRD) would be estimated using well-documented methods for preliminary estimates of economic damage as a basis, including restoration costs and compensation. Federal regulations (43 CFR §11.30-84; 15 CFR §990.27) outline procedures and tools which can be used to establish the magnitude and value of natural resource damage claims. In addition, each relevant Federal agency has developed its own set of implementation guidelines. DNV GL suggests using NOAA's expedited damage assessment method, which relies heavily on existing information rather than on collecting new data. Where existing information is insufficient, estimates will be developed by DNV GL; the associated uncertainties will be discussed in the report in the context of the overall cost results. Three example areas as discussed below.

Construction

Published, accepted methods will be used to estimate actual construction costs for projects such as wetland creation, wetland restoration, and monitoring^{2,3} and to estimate the economic value of loss of use of the natural resources by humans⁴(e.g., Kopp and Smith, 1993; Smith, 1996).

Lost Services

If deemed to be a potential significant cost contributor, lost services will also be quantified for the alternatives. Lost services can include a wide range, for example:

- Services that habitat provide to other resources, such as clean water and soils
- Passive use services (e.g., wildlife, public lands)
- Waterbodies and rivers provision of commercial, recreational, subsistence, flood control, education, and research services
- Historical and cultural services

Administration

The administration/trustee cost factors currently included in the Type A NRD models usually significantly underestimate actual oversight and management costs. They do not include costs such as implementation oversight and approval, preparation of NEPA documentation, public participation, coordination and administration of the decision making process, and record keeping. DNV GL will either adjust the factors in the models, or develop a reproducible and defensible approach suitable for this study.

Finally, the results from Task B will be used to identify potentially affected aspects and their services. A thorough literature review will gather existing data on ecological and natural services and economic conditions, omitting speculative services. Using staff biologists and natural resources experts, DNV GL will conduct a high level, off-site assessment of the existing natural resources in the modeled spill area and assess potential for

² Bergstrom, J.C., J.R. Stoll, J.P. Titre, and V.L. Wright. 1990. Economic value of wetlands-based recreation. *Ecological Economics*, 2: 129-147.

³ King, D. M. and R. Costanza. 1994. The cost of wetland creation and restoration. University of Maryland Center for Environmental and Estuarine Studies Chesapeake Biological Laboratory, Solomons MD.

⁴Kopp, R.J., and V.K. Smith. 1993. Valuing natural assets: The economics of natural resource damage assessment. Washington, DC: Resources for the Future.

spill damage within this area. DNV GL will use publically available data including aerial photos, existing habitat/wetlands mapping, and mapped sensitive species and habitat locations to determine existing conditions in the modeled spill area. Comparative valuations and direct economic contributions will provide input to develop upper and lower bounds for initial damage and residual damage following restoration. The value of temporarily unavailable services will be included in the estimate. Restoration costs will similarly be based on experience with previous projects and literature.

Task H. Governmental Costs of Worst Case Spills

Some of the government costs related to response and restoration (NRDA) will be estimated as part of Task G. Non-NRDA government costs would be estimated by scaling costs for previous events using factors to correct for misalignment in the extent of the spill; severity of the damage; sensitivity of the environment; and sensitivity of the public. The general approach will be to identify all potentially affect governmental agencies/departments, and build up a scalable cost basis to be applied to each of the alternatives. The baseline data would be gathered through a literature search and discussions with State personnel.

The methodology suggested for natural resource damage will likely quantify a large portion of the potential direct Government Cost (e.g., jobs lost, tax rates). In addition, indirect Government cost will be estimated using a first principles approach, building on work previously conducted for recent spills. The proposed approach is to review data to identify linkages to:

1. Indirect effects to jobs throughout the supply chain
2. Induced/ secondary effects on job generation as a result of increased incomes
3. Employment effects from changes to infrastructure or access (e.g., direct jobs and jobs in other sectors)

Task I. All Other Economic Damages of Worst Case Spills

The assessment of the project economics will be based on a risk approach, i.e., the influence of risks and uncertainties affecting the projects indicators (e.g. IRR and NPV) will be determined. This means that the results will be presented in terms of uncertainty distributions and probability density functions. It means, moreover, that the main risk drivers behind these project indicators will be identified. These risk drivers will be used as basis for identifying risk mitigating actions to reduce the project risk exposure and also improve the project value.

The project economic analysis will require a project schedule consisting of all main activities including (i) permitting, (ii) procurement, (iii) fabrication and construction, (iv) installation and commissioning. The commercial value will be assessed by performing the following steps:

- Design a discounted cash flow (DCF) model structure so that all subsequent analyses can be made for the overall project and also for each of the main project elements. The cash flows will consist of time-varying cost and revenue streams. The model environment for the DCF model will be Excel with the add-on @RISK (alternatively the tool Extend might also be used). Important issues that need to be addressed in the DCF model are
 - Project schedule
 - Lifetime of the project

-
- Depreciation and amortization of the assets (interval, rate, residual value)
 - Appropriate tax rates
 - Discount rate (cost of equity, cost of debt)
 - Distribute the Capex and Opex cost streams in the DCF model over time. The vehicle for modelling the time distribution of these cost streams is mainly the schedule derived.
 - It is foreseen that parts of the transportation system are subject to regulations on allowable profit rates. Such restrictions will provide boundaries on tariffs.
 - Include risks and uncertainties affecting the size and time distribution of the cost and revenue streams. The risks will be collected from (i) arranging risk workshops with the stakeholders (owners, regulatory authorities) and (ii) using information from DNV GL experience databases. The cost uncertainties will be mainly derived from the principles of the American Association of Cost Engineers (AACA) together with input from DNV GL specialists.
 - Valuation exercise (where all results will be derived from Monte Carlo simulation of the risked DCF model):
 - Calculate the risked value of the project for the shareholders of the project based on the modelled cash flows and on the agreed discount rate
 - Provide financial and economic return metrics to the relevant stakeholders such as NPV, IRR
 - Identify main risk drivers and propose risk mitigating actions based on risk / reward considerations.

Deliverables and Communication

The deliverables will include:

1. **Monthly status reports and presentations of Task results.** This is envisaged in a webinar format, but can be conducted in person if desired. The advantages of a webinar format include: easy to hold with any number of desired participants; support presentations by experts wherever they may be located; reduced project time/resources spent on meetings so there is no efficiency driver to minimize the number of meetings. As a result of frequent updates, each task's results will be presented as the project progresses, and participants who want to understand the details will have opportunity to ask questions without waiting for comment responses in writing. A number of these can be selected to include public information presentations.
2. **Draft Task Appendices.** These will be issued concurrently with the monthly status webinar, and we will request that comments be provided on the issued draft task reports prior to the next monthly meeting. This approach enables the team to learn even more about what is important to stakeholders/reviewers early in the project.
3. **Draft Report.** This document will be issued as a main report supported by the previously-issued appendices, updated per comments. Up to two sets of consolidated comments will be formally responded to and updates made to the report.
4. **Final Report.** The final report will be issued and presented in a public information presentation.

Proposed Budget

This section presents the proposed budget for all time and materials for completing the tasks identified in the Requested Scope of Work. This budget is valid until December 31, 2017.

The scope of work in this project strongly reflects DNV GL's purpose to safeguard life, property and the environment. As such, the below budget reflects a 15% discount on standard US rates for risk assessment work in oil and gas.

Invoicing and Payment

Invoicing will be according to the following milestones:

Task	Suggested Milestone Payment
<i>Define Worst Case Spill and Response</i>	
A. Duration & Magnitude	\$37,500
B. Fate & Transport	\$70,000
C. Required Containment & Cleanup	\$39,000
<i>Define Worst Case Spill Impacts</i>	
D. Public H&S Impacts	\$84,500
E. Ecological Impacts	\$77,500
F. Restoration Measures	\$59,000
<i>Define Worst Case Spill Costs</i>	
G. Natural Resource Damage	\$50,500
H. Governmental Costs	\$48,500
I. All other Economic Damages	\$72,500
Draft Report	\$108,500
Final Report	\$108,500
TOTAL	\$756,000

Payment shall be within 30 days of the invoice date.

Assumptions, Conditions and Limitations (All)

In addition to assumptions, conditions and limitation explicitly stated elsewhere in this document, this proposal is issued on the basis of the following assumptions, conditions and limitations with respect to deliverables, scope of work, schedule, costs etc.:

1. Travel costs are included for up to 4 in-person meetings for 2 persons each. Additional meetings / travel should be agreed between the parties, and may incur additional cost. All webinar costs are included in the travel costs. Planned travel includes 4 visits to the project area for 2 people, which includes project kickoff, 2 public presentations, and project closure. Additional Travel costs and associated business expenses are not included in the cost estimates and will be billed at cost.
2. The budget assumes that all comments will be assembled and provided to DNV GL as a single set per deliverable. Significant inefficiencies result from "trickle- in" of comments over a period of weeks.
3. This proposal and budgetary estimate is based on DNV GL's current knowledge and understanding of the scope of work. If the study is more complicated than DNV GL's initial understanding, DNV GL will initiate a discussion with State of Michigan to potentially amend the scope of work.

References

The following data sources and scientific publications are cited in this proposal.

Ad-Hoc Industry Natural Resource Management Group, "Beyond the Headlines: Best Practices to Restore Natural Resources Injured by Long-Term Hazardous Waste Releases, Oil Spills and Transport and Other Accidents", Bloomberg BNA Daily Environment Report, August 18, 2014.

University of Wisconsin Sea Grant Institute, Web page: Great Lakes and Wisconsin Water Facts – Great Lakes and Fresh Water. 2013

<http://seagrant.wisc.edu/Home/AboutUsSection/PressRoom/Details.aspx?PostID=796>.

Accessed April 15, 2016.

Michigan Petroleum Pipeline Task Force Michigan Petroleum Pipeline Task Force Report; Michigan Department of Attorney General Lansing, MI, 2015.

International Oil and Gas Producers/IPIECA. Oil spill risk assessment and response planning for offshore installations, Final report, 2013. Available from:

<http://oilspillresponseproject.org/sites/default/files/uploads/JIP%206%20-%20Oil%20spill%20risk%20assessment.pdf>.

